Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim **1** (previously presented): A keep-warm system to provide freeze protection for a fuel cell power plant **(10)**, comprising:

a. a fuel cell stack assembly (CSA) **(12)** including an anode **(16)**, a cathode **(18)**, an electrolyte **(14)**, and a cooler **(20)**;

b. fuel supply means **(25)** for providing a supply of fuel, at least some of the fuel being supplied as reactant to the anode **(16)**;

c. a source of oxidant reactant **(22)** operatively supplied to the cathode **(18)**;

d. a water management system **(30, 28)** operatively connected to the cooler **(20)** of the CSA **(12)**;

e. thermal insulating means **(64)** enclosing at least one of the CSA **(12)** and the water management system **(30, 28)** for providing thermal insulation thereof; and

f. catalytic fuel burner means **(66)** operatively connected to the fuel supply means **(25)** and to the source of oxidant reactant **(22)** for catalytically reacting the fuel and oxidant and providing a source of heat, the burner means **(66)** being disposed and operative to supply heated gas into the thermal insulating enclosure means **(64)**, and to the at least one of the CSA **(12)** and the water management system **(30, 28)** in the thermal insulating enclosure

means **(64)**, thereby to prevent freezing of water in freeze-sensitive parts of the fuel cell power plant.

Claim **2** (original): The keep-warm system of claim **1** wherein the catalytic burner means **(66)** includes a catalytic surface **(72)** for combustively reacting the fuel in the presence of oxidant in a flameless manner to release heat only in a thermal range less than about 1000^{0} F.

Claim **3.** (original): The keep-warm system of claim **2** wherein the heat released by catalytic combustion at the catalytic burner means **(66)** is in the thermal range of about 200^{0}-700^{0} F.

Claim **4.** (original): The keep-warm system of claim **2** wherein the source of oxidant reactant **(22)** is ambient air, the air being supplied to the catalytic burner means **(66)** and mixed with fuel from the fuel supply means **(25)** for combustively reacting the mixture in the presence of the catalytic surface **(72)** to release heat.

Claim **5.** (original): The keep-warm system of claim **1** wherein the fuel supply means **(25)** comprises a container of hydrogen stored under pressure.

Claim **6.** (original): The keep-warm system of claim **1** wherein both the CSA **(12)** and the water management system **(28, 30)** are substantially enclosed by the thermal insulating means **(64)**.

Claim **7.** (original): The keep-warm system of claim **4** wherein the electrolyte (**14**) of the CSA **(12)** is a proton exchange membrane (PEM), the fuel from the fuel

supply means **(25)** is hydrogen, and the heat released by catalytic combustion at the catalytic burner means **(66)** is in the thermal range of about 200^0 - 700^0 F.

Claim **8**. (currently amended): In a fuel cell power plant **(10)** having a fuel cell stack assembly (CSA) **(12)** including an anode **(16)**, a cathode **(18)**, and an electrolyte **(14)**, a fuel supply **(25)** for providing fuel to at least the anode **(16)**, a source of oxidant reactant **(22)** for supplying at least the cathode **(18)**, and a water management system **(30, 28)** operatively connected to the CSA **(12)**, the method of preventing freezing of water in freeze-sensitive parts of the fuel cell power plant **(10)** during shutdown, comprising the steps of:

~~g~~a. selectively flowing **(62, 63, 69, 67)** fuel **(25)** and oxidant **(22)** to a catalytic fuel burner **(66)** during shutdown for catalytic combustion to provide heated gas;

~~h~~b. convectively flowing the heated gas into heat transfer relation with the freeze-sensitive parts of the fuel cell power plant **(10)** to provide heat thereto; and

~~i~~c. thermally insulating the freeze-sensitive parts of the fuel cell power plant **(10)** including the heated gas flowing in heat transfer relation therewith.

Claim **9**. (previously presented): The method of claim **8** wherein the step of selectively flowing fuel and oxidant to a catalytic fuel burner provides heated gas in a thermal range of about 200^0 - 700^0 F.

Claim **10**. (previously presented): The method of claim **8** wherein the step of thermally insulating the freeze-

sensitive parts of the fuel cell power plant (10) comprises thermally insulating both the CSA (12) and the water management system (28, 30).

Claim **11.** (currently amended): A keep-warm system to provide freeze protection for a fuel cell power plant **(10)**, comprising:

~~j~~a. a fuel cell stack assembly (CSA) **(12)** including an anode **(16)**, a cathode **(18)**, and an electrolyte **(14)**;

~~k~~b. fuel supply means **(25)** for providing a supply of fuel, at least some of the fuel being supplied as reactant to the anode **(16)**;

~~l~~c. a source of oxidant reactant **(22)** operatively supplied to the cathode **(18)**;

~~m~~d. a water management system **(30, 28)** operatively connected to the CSA **(12)**;

~~n~~e. thermal insulating means **(64)** enclosing at least one of the CSA **(12)** and the water management system **(30, 28)** for providing thermal insulation thereof; and

~~o~~f. catalytic fuel burner means **(66)** operatively connected to the fuel supply means **(25)** and to the source of oxidant reactant **(22)** for catalytically reacting the fuel and oxidant and providing a source of heat, the burner means **(66)** being disposed and operative to supply heated gas into the thermal insulating enclosure means **(64)**, and to the at least one of the CSA **(12)** and the water management system **(30, 28)** in the thermal insulating enclosure means **(64)**, thereby to prevent freezing of water in freeze-sensitive parts of the fuel cell power plant.

Claim **12**. (previously presented): The keep-warm system of claim **11** wherein the catalytic burner means **(66)** includes a catalytic surface **(72)** for combustively reacting the fuel in the presence of oxidant in a flameless manner to release heat only in a thermal range less than about 1000^0 F.

Claim **13**. (previously presented): The keep-warm system of claim **12** wherein the catalytic burner means **(66)** is separate from the CSA **(12)**.

Claim **14**. (previously presented): The keep-warm system of claim **13** wherein the CSA **(12)** includes a cooler **(20)** and the water management system **(30, 28)** is operatively connected to the cooler **(20)** of the CSA **(12)**.

Claim **15**. (previously presented): The keep-warm system of claim **12** wherein the heat released by catalytic combustion at the catalytic burner means **(66)** is in the thermal range of about 200^0-700^0 F.

Claim **16**. (previously presented): The keep-warm system of claim **12** wherein the source of oxidant reactant **(22)** is ambient air, the air being supplied to the catalytic burner means **(66)** and mixed with fuel from the fuel supply means **(25)** for combustively reacting the mixture in the presence of the catalytic surface **(72)** to release heat.

Claim **17**. (previously presented): The keep-warm system of claim **11** wherein the fuel supply means **(25)** comprises a container of hydrogen stored under pressure.

Claim **18**. (previously presented): The keep-warm system of claim **11** wherein both the CSA **(12)** and the water management system **(28, 30)** are substantially enclosed by the thermal insulating means **(64)**.

Claim **19**. (previously presented): The keep-warm system of claim **11** wherein, for a system scaled commensurately with a consumption by catalytic fuel burner means **(66)** of not more than about 0.014 pph of hydrogen for about a 75 kw PEM fuel cell stack assembly, the insulation value of the thermal insulating means **(64)**, as determined by at least the "R" value and thickness of said thermal insulating means, is sufficient to prevent freezing of water in freeze-sensitive parts of the plant for at least several days at external temperatures as low as -40^{0} C.

Claim **20**. (previously presented): The keep-warm system of claim **19** wherein the electrolyte (**14**) of the CSA **(12)** is a proton exchange membrane (PEM), the fuel from the fuel supply means **(25)** is hydrogen, and the heat released by catalytic combustion at the catalytic burner means **(66)** is in the thermal range of about 200^{0} - 700^{0} F.

Arguments/Comments in Response to Office Action

This Amendment/Response is in response to the non-final Office Action dated Feb. 20, 2004 in the present RCE application. Claims 1-20 were, and remain, pending in the application. Claims 8-10 were allowed and claim 19 had been objected to as containing allowable subject material but depending from a rejected claim. Applicants appreciate such indication of allowability. Claims 1-7, 11-18, and 20 were rejected. Independent claims 8 and 11 are amended herewith to correct a minor formal error previously in the alphabetical identifiers for the several elements of those claims.

Although the Examiner has indicated allowable subject matter in claim 19, claim 20, which depends from claim 19, has been rejected. It is respectfully submitted that such rejection of claim 20 is not well founded in view of the potential allowability of claim 19, and probably occurred through inadvertence. Accordingly, withdrawal of such rejection of claim 20 is respectfully solicited.

Claims 1 and 11 indicate a) in the preamble, that the objective of the claim(s) is to provide a keep-warm system to provide freeze protection for a fuel cell power plant, and b) in the concluding portion of the claim, that the recited combination of structure is "thereby to prevent freezing of water in freeze-sensitive parts of the fuel cell power plant". This language in both the preamble and the concluding portion of the claims is intended to distinguish the character and functioning of the recited structure from any such structure that does not specifically or clearly "prevent freezing of water in a fuel cell power plant". The importance will be discussed further herein below.

Referring to the earlier rejection(s) of Claims 1-7 and the recent rejection of claims 11-18, Applicants wish to repeat, through incorporation by reference, the arguments and distinguishing comments submitted with their Responses dated May 20 and Dec. 19, 2003. As clearly recited by Claims 1 and 11, the invention has as its claimed purpose the prevention of freezing of water in freeze-sensitive parts of the fuel cell power plant. This is accomplished via the novel and unobvious combination and functioning of elements as recited in Claims 1 and 11. Briefly and simply stated,

there is provided a CSA, a fuel supply, a source of oxidant reactant, a water management system, and importantly, a thermal insulating enclosure for one or more of the CSA and the water management system, and a catalytic burner. The burner catalytically reacts fuel and oxidant to provide heat, and is disposed such that the heat is provided into the thermal insulating enclosure. The dependent claims 2-7 and 12-18 recite the character of the catalytic burner, the combustion reaction process and temperature, the use of air and pressurized hydrogen as the reactants for the burner, and that both the CSA, which is a PEM, and the water management system are within the thermal insulating enclosure. This arrangement affords a fuel and energy-efficient means for keeping the critical elements from freezing for long intervals of 7 days or more under external freezing conditions.

It is respectfully submitted that neither the Acker , the Gebhardt, et al, nor the Tomomura references either alone or in any appropriate teaching combination, either anticipate or render patentably obvious the claimed keep-warm, freeze-protection system of the invention for a fuel cell power plant.

Neither the Acker, the Gebhardt, et al, nor the Tomomura references in any way teach the use of a catalytic burner and a thermal insulating means for providing a keep-warm system to prevent freezing of water-sensitive parts of the fuel cell power plant. Since clearly no single one of the applied references provides all of the claimed structure, which might then provide the basis for an anticipating "102' reference, the Examiner relies upon a combination of references in making the rejections. Yet, to properly make such combination, there must be a teaching or suggestion of doing so for the reasons (functions) recited in the structural claims. That simply does not occur with respect to the applied references.

The Examiner, in his Responses contained in the Office Actions of Oct. 16, 2003 and Feb. 20, 2004, relies mainly on an assertion that the fuel cell system of Acker "resides outside of an airspace (e. g., a house) and is connected to an air circulation path with an interior region of the air space via a cathode inlet conduit and a cathode outlet conduit." Applicants will acknowledge that that is what Acker discloses, however the Examiner's comments go on to say "the system is analogous to a residential heat pump unit, which has a casing to prevent the components for (sic) direct exposure to the ambient" and "(T)hus, the casing of the fuel cell system is considered as a thermal insulating means, which encloses the fuel cell stack and the cooling subsystem".

In actuality, nowhere does the Acker reference show, mention, disclose or suggest "thermal insulating means enclosing at least one of the CSA and the water management system for providing thermal insulation thereof". Indeed, nowhere does it suggest any kind of thermal insulating enclosure. The so-called "casing" of Fig. **2** of Acker is simply a 3-dimensional block diagram said to actually be the "fuel cell system (14)", which includes the fuel cell stack 50. It is from this that the Examiner develops the strained hypothesis **a**.) that Acker must be showing some sort of enclosure (why?), and **b**.) that the fuel cell system of Acker is purportedly analogous to a heat pump, which has a casing, and further, **c**.) that heat pump casings are to protect heat pump elements from the ambient, and still further **d**.) that thus the imagined casing of the fuel cell system of Acker is considered as a thermal insulating means enclosing a fuel cell stack and cooling system.

Firstly, the Examiner's reasoning is based on suppositions that simply are not supported by the actual prior art under consideration. Secondly, even if one were to accept that Acker somehow discloses a "casing", which Applicants vigorously challenge, there simply is not adequate support for the assertion that such a casing is thermally insulating and is for the purpose, in combination with a catalytic fuel burner, of preventing freezing of freeze-sensitive parts of the fuel cell power plant, as is clearly recited in Claims 1 and 11. Thirdly, and again temporarily accepting that somehow Acker "discloses" a thermally insulating casing, which Applicants vigorously challenge, there is no basis or teaching for combining the Acker structure and the Gebhardt et al structures to arrive at the structure recited in claims 1 and 11. It is here that the allegedly "functional" language of claims 1 and 11 further contributes to the legal inappropriateness of making a combination of these references on which to base a rejection under 35 USC 103.

Applicants have repeatedly emphasized that not only does no single reference fully disclose the invention claimed in claims 1 and 11, but that neither does any reasonable teaching of the references combined by the Examiner in making the rejection. While this is true even in the instance of the bare recitation of the collection of components in those claims absent any of the so-called "functional" language, it is made even the more so when that language is present. The Examiner has totally dismissed any significance in the language of the claim preambles and the "thereby" clauses, saying they express "intended use" and as such in an apparatus claim, are to be given no weight, citing *In re Thuau* and *In re Mason*. Applicants respectfully

submit that firstly the claimed combination is patentably unobvious even in the absence of the "functional" language of the preamble and the "thereby" clause and secondly, is properly all the more so with the inclusion of that language.

Firstly, the Acker reference is concerned with air purification, as for a building or vehicle, through use of a fuel cell system. Coincidentally, brief mention is made at Col. 6, lines 13-15, that the fuel cell stack may provide heat as an adjunct to the air purification. It contains no mention or showing of thermal insulating means or a reason for having same, and it does not disclose a catalytic fuel burner means. One must then look to Gebhardt et al to see what in it, if anything, suggests that Acker be modified to become the recitation of elements of the present claims 1 and 11, either with or without the "functional" language. Gebhardt et al never discloses a thermal insulating means for retaining heat and, arguably, may not even disclose a "catalytic fuel burner means", at least not one separate from the cell stack as required by dependent claim 13. Paragraph [0016] mentions gas inlets and distributors being coated with catalyst for oxidation and/or reduction reactions to produce heat. Yet the only time the phrase "catalytic burner" is used is in paragraph [0022] in conjunction with the electrodes of the fuel cell stack itself. Further to the point, what is the teaching or impetus in either or both of the applied references to combine certain elements of one with certain different elements of the other to arrive at even the bare recitation of elements contained in claims 1 and 11? Applicants fail to find it/them.

Indeed, while Applicants will acknowledge the premise of *In re Thuau* and *In re Mason* that statements of "intended use" in apparatus claims are generally given no weight, it should also be noted that cases such as *Pitney Bowes, Inc. v Hewlett-Packard Co.*, 51USPQ2d 1161, 1165-66 (Fed. Cir. 1999) and *Kropa v Robie*, 88USPQ 478, 481 (CCPA 1951) serve to temper that position (see MPEP 2111.02 at 2100-49). Specifically, the *Pitney Bowes* case states "If the claim preamble, when read in the context of the entire claim, recites limitations of the claim, or, if the claim preamble is 'necessary to give life, meaning, and vitality' to the claim, then the claim preamble should be construed as if in the balance of the claim.". The preamble of the present claims 1 and 11 recite "A keep-warm system to provide freeze protection for a fuel cell power plant", and as such serves to define the claimed invention's limitations. A "keep-warm" system is contrasted with a cold-start system such as in Gebhardt et al in that the former must provide structure for maintaining a fuel cell system form freezing whereas the latter need only provide structure for a significant

surge of heat to effect a cold start, perhaps from freezing. Moreover, the Aker reference is in no way concerned with keeping the fuel cell system warm or protecting it from freezing.

Applicants respectfully submit that while the claims 1 and 11 would be unobvious over any combination taught or suggested by Acker and Gebhardt et al even without the purported "functional" language of the preamble and the "thereby" clause, such patentable unobviousness is even greater in the context of the implied limitations of the preamble requiring "A keep-warm system to provide freeze protection for a fuel cell power plant...". Since there is no 35 USC 102 anticipation, allowance of claims 1 and 11 would not have the impermissible effect of reading on a singular piece of prior art. Thus the remaining concern or question is whether the invention of claims 1 and 11, including their preambles for their defining effect, is obvious in view of any combination fairly and reasonably taught or suggested by the Aker and Gebhardt et al references. Applicants respectfully submit, for the forgoing reasons, that it is not obvious, and thus should be held to be patentable.

Accordingly, entry of this amendment is respectfully requested, and favorable consideration/reconsideration is respectfully solicited. If any issue(s) remains, or arises, that might be resolved by telephone, it is respectfully requested that Applicant's attorney be contacted at telephone: (860) 313-4402.

Respectfully submitted,

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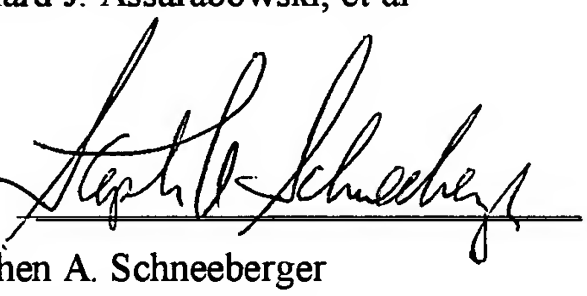
By 

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